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Haverkost

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(54) **RF ELECTRODES ON MULTIPLE FLEXIBLE WIRES FOR RENAL NERVE ABLATION**

(76) Inventor: **Patrick A. Haverkost**, Brooklyn Center, MN (US)

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

164,184 A	6/1875	Kiddee
1,167,014 A	1/1916	O'Brien

(Continued)

FOREIGN PATENT DOCUMENTS

CN	101511292 A	8/2009
DE	10038737 A1	2/2002

(Continued)

OTHER PUBLICATIONS

CardioVascular Technologies Inc., "Heated Balloon Device Technology," 11 pages, 2008.

(Continued)

Primary Examiner — Michael Peffley
Assistant Examiner — Amanda Zink
(74) *Attorney, Agent, or Firm* — Kacvinsky Daisak Bluni PLLC

(57) **ABSTRACT**

A catheter includes a flexible shaft having a distal end dimensioned for deployment within a patient's renal artery. A number of elongated resilient members are mounted along a longitudinal length of the distal end of the shaft, and are extensible radially from the shaft at regions defined between longitudinally spaced-apart engagement locations. One or more electrodes are mounted on each of the resilient members at the radially extensible regions. A number of conductors are electrically coupled to the electrodes and extend along the shaft of the catheter. The elongated resilient members are collapsible when encompassed within a lumen of an outer sheath and extensible radially outward from the shaft at the regions defined between the longitudinally spaced-apart engagement locations when the catheter and the resilient members are axially extended beyond the distal tip of the sheath. RF energy is delivered to the electrodes for ablating perivascular renal nerves.

9 Claims, 12 Drawing Sheets